STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

Docket No. 2001-507-E

In Re: Application of Palmetto Energy Center for a Certificate of Environmental Compatibility and Public Convenience and Necessity to Construct a Major Utility Facility

DIRECT TESTIMONY

OF

DR. GEORGE C. HOWROYD, III (Tab 1)

and

JOHN E. NILAND (Tab 2)

FOR

PALMETTO ENERGY CENTER, LLC

(see separate bound document for Direct Testimony and Exhibits of Art Holland for Palmetto Energy Center, LLC)

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DIRECT TESTIMONY OF DR. GEORGE C. HOWROYD, III

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is George Clarion Howroyd, III. My business address is 115 Perimeter Center Place, N.E., Suite 700, Atlanta, Georgia, 30346.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed as a Principal Engineer by CH2M HILL, a Denver-based engineering consulting firm. CH2M HILL is an international engineering and environmental consulting company with approximately 12,000 employees in more than 120 offices worldwide. Our annual business volume is more than $2 billion. CH2M HILL is engaged in the business of providing environmental, engineering, and design services for new and existing industrial facilities, including the power generating industry.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I received a Ph.D. in Mechanical Engineering from the University of Waterloo in Ontario, Canada in 1979. I also have a M.Sc. (1975) and a B.Sc. (1973) from the

same university. I have more than 20 years of experience in environmental engineering and consulting. Prior to my employment at CH2M HILL (in 1995), I was employed by Dames & Moore, a Los Angeles based engineering consulting firm, from 1977 through 1995. When I left Dames & Moore, my position was Division Manager, Air Quality Services. While working for both firms, I have been actively involved in conducting environmental assessments, environmental permitting, domestic and international environmental audits and compliance assessments, emission inventory development, toxic air pollutant evaluations and assessments, dispersion modeling, control technology assessments and evaluations, regulatory analysis and interpretation, air quality and meteorological monitoring, and preparing and sponsoring expert testimony in the same areas. I have assisted domestic and worldwide international clients in the general manufacturing, energy and power, pulp and paper, automotive, petrochemical, petroleum, steel, utility, and food products sectors.

Q. ON WHOSE BEHALF ARE YOU APPEARING IN THIS PROCEEDING?

A. I am appearing on behalf of Palmetto Energy Center, LLC ("Palmetto Energy"), a subsidiary of Calpine Corporation ("Calpine").

Q. WHAT ARE YOUR RESPONSIBILITIES WITH REGARD TO THE PALMETTO ENERGY PROJECT?

A. CH2M HILL is responsible for the environmental permitting of the proposed facility. This area of responsibility includes the preparation of the permit applications and supporting documentation for all environmental and related permits that will be required for the construction and operation of the facility. As the Principal Engineer

on the project, I am responsible for directing and overseeing CH2M HILL's efforts in this regard, and I am the primary interface between CH2M HILL and Calpine Corporation. I also have responsibility for assisting Calpine with discussions and negotiations with the appropriate State and Federal permitting agencies.

Q. ARE YOU FAMILIAR WITH THE FACTS AND INFORMATION SET FORTH IN PALMETTO ENERGY'S APPLICATION?

A. Yes. I was actively involved in the preparation of the Application. The Application and the supporting documentation contained in the Application, accurately reflects the work done by CH2M HILL, including our conclusions and recommendations.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to support Palmetto Energy's Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct and operate a generating plant for the production of electric power and energy in York County, near Fort Mill, South Carolina ("Palmetto Energy Facility") and to answer any questions regarding environmental issues related to the facility. In my testimony, I will present evidence regarding the potential impacts on water quality, air quality and natural resources from the construction and operation of the Palmetto Energy Facility, and demonstrate why these potential impacts will be minimal and not adverse.

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE PROPOSED PALMETTO ENERGY FACILITY?

A. I have concluded that:

- From an environmental standpoint, the proposed Palmetto Energy Facility will be a state-of-the-art combined-cycle combustion turbine facility;

- the Palmetto Energy Facility will utilize clean-burning natural gas, which has significantly lower emissions of carbon-based pollutants, as well as pollutants such as sulfur dioxide, nitrogen oxides and other pollutants, than coal- or oil-fired generation; the Palmetto Energy Facility also produces less pollutants per megawatt-hour than other existing gas-fired facilities presently installed in South Carolina due to the use of current technology and relative efficiency of the Palmetto Energy Facility – if the Palmetto Energy Facility displaces any existing energy generation of a traditional nature (*i.e.*, coal- or oil-fired generation), the result will be less emissions;

- the Palmetto Energy Facility's efficient use of river water in the plant cooling system will not have any significant or adverse impact on the Catawba River - Palmetto Energy will utilize advanced technology design practices to ensure that aquatic species in the river will not be impacted by the water intake and discharge systems;

- the Palmetto Energy Facility's water withdrawal from the river will not have a significant or adverse impact on the flow of water downstream of the Palmetto Energy site;

- the design of the Palmetto Energy Facility from an environmental standpoint is consistent with the best design practice and the Palmetto Energy Facility utilizes what is acknowledged by the South Carolina Department of Health and Environmental Control ("DHEC") and the U.S. Environmental Protection Agency ("EPA") to be the best achievable control technology ("BACT") to ensure minimal environmental impact;

- any environmental impact of the Palmetto Energy Facility is justified considering the available technology, the nature and economics of other alternatives and other relevant issues – the proposed facility is among the least environmentally-intrusive alternatives available to generate power.;

- the approval, construction and operation of the Palmetto Energy Facility will not significantly affect South Carolina's ability to site (from an environmental standpoint) any additional new generating facilities that may be needed to meet future power needs;

- the Palmetto Energy Facility can be expected to receive the necessary environmental permits to construct and operate;

- the Palmetto Energy Facility will comply with all applicable environmental rules and regulations, and no environmental standard will be compromised, threatened, or exceeded as a result of its operation;

- Palmetto Energy has, or is in the process of conducting the necessary environmental studies to assess the impact of the Palmetto Energy Facility on the environment; and

- based on its operating track record, the environmental studies, and the design efforts in this case, Calpine Corporation can be expected to design, construct and operate the Palmetto Energy Facility while adequately protecting and minimizing any effect on the environment.

Based on my knowledge of the project, review of the Application and testimony of other witnesses, as well as my findings above, I have concluded that, in my opinion, this Honorable Commission should grant Palmetto Energy's Application.

Q. WHAT ARE YOUR RECOMMENDATIONS REGARDING THE PROPOSED PALMETTO ENERGY FACILITY?

A. I recommend that this Honorable Commission grant Palmetto Energy a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct and operate an electric generating plant in York County, South Carolina.

Q. PLEASE DESCRIBE CALPINE'S ENVIRONMENTAL RECORD.

A. Calpine is committed to a long-term presence in York County for the entire period of the facility's projected 30-year life. It is recognized that being a responsible corporate citizen with a vision of protecting the environment is absolutely vital to being welcomed into the community in which they will operate. Calpine is in the business of developing and operating state-of-the-art power generating facilities that are among

the cleanest in the nation. On a per kilowatt basis, the Palmetto Energy Facility will emit less than 10 percent of what would be emitted from a traditional coal- or oil-fired generating facility. Calpine has and will continue to develop and operate its power generating facilities in a manner that is environmentally sustainable on a long-term basis.

Q. PLEASE GENERALLY DESCRIBE THE PROPOSED PALMETTO ENERGY FACILITY AND ITS LOCATION.

A. The proposed Palmetto Energy Facility is a combined-cycle, natural gas-fired combustion turbine generating plant. The design of the Palmetto Energy Facility is based on three natural gas-fired combustion turbine generators, a waste heat recovery system, and a steam turbine generator that will generate up to 970 megawatts (MW) of electric power. The Palmetto Energy Facility is to be located on an approximate 65-acre tract of land in the Bradley Industrial Park, near Fort Mill, South Carolina in York County.

ENVIRONMENTAL PROJECT DESIGN

Q. PLEASE DESCRIBE WHAT STEPS HAVE BEEN TAKEN BY PALMETTO ENERGY TO PROTECT THE ENVIRONMENT.

A. Palmetto Energy has gone to great lengths to design a highly efficient state-of-the-art facility that will minimize its impact on the environment. As it has been designed, the Palmetto Energy Facility will comply with all applicable state and federal environmental regulations and statutes.

Q. WILL THE PALMETTO ENERGY FACILITY COMPLY WITH ALL APPLICABLE ENVIRONMENTAL RULES AND REGULATIONS?

A. The Palmetto Energy Center is being designed to comply with all applicable local, State, and Federal environmental rules and regulations so that no environmental standard will be compromised, threatened, or exceeded as a result of its operation. Palmetto Energy has gone to great lengths to design a highly efficient state-of-the-art facility that will minimize its impact on the environment through the use of advanced technology and clean-burning natural gas. Palmetto Energy's Air Permit Application, which was submitted in February of 2002, demonstrated through dispersion modeling that the facility will have an insignificant impact on ambient air quality at all locations and for all pollutants. Palmetto Energy's NPDES water and wastewater permit application (submitted in February of 2002) demonstrates that the facility will not have an adverse impact on the Catawba River as a result of water withdrawal or wastewater discharge to the river during operation. Stormwater runoff during both construction and operation will be controlled in accordance with all applicable requirements. With respect to wetlands, threatened and endangered species, and archaeological resources, Palmetto Energy has conducted extensive studies to identify those areas or specific resources so that they can be avoided or otherwise mitigated in accordance with the requirements of the appropriate agencies.

Q. PLEASE DESCRIBE HOW PALMETTO ENERGY WILL CONTROL AIR EMISSIONS FROM THE FACILITY.

A. Palmetto Energy will use BACT to control emissions in accordance with state and federal standards and requirements. Only clean burning pipeline natural gas will be

burned in the combustion turbines. When compared to traditional oil- or coal-based systems, the combustion turbines that will be used by Palmetto Energy are extremely efficient in terms of their ability to generate large amounts of power with relatively low emissions to the atmosphere. To reduce emissions even further, Palmetto Energy will also install an advanced technology Selective Catalytic Reduction (SCR) emission control system that will result in an additional 85 percent reduction in nitrogen oxide (NOx) emissions from the facility. A continuous emission monitoring system will be employed on the combustion turbines to continuously monitor NOx emissions and to ensure compliance with the regulations. The primary source of emissions from this facility will be three General Electric Model 7FB combustion turbines, each of which will be equipped with a natural gas-fired heat recovery steam generator ("HRSG") designed to efficiently recover waste heat for the purpose of generating additional power. The emissions will be released from three 160-foot exhaust stacks, each of which will serve an individual turbine and HRSG combination. Emissions from these three stacks will include NOx (controlled by using state-of-the-art Dry Low-NOx combustors in the turbines and an add-on SCR emission control device), SO_2 (controlled by burning only natural gas, which is virtually free of sulfur), CO and VOC (both will be minimized through the use of a highly efficient state-of-the-art combustion turbine), and PM-10 (limited by using only clean-burning natural gas). An additional source of emissions will be a small auxiliary boiler used to generate steam during periods of startup and shutdown. This small boiler will generate less than five percent of the emissions that will be generated by the combustion turbines and HRSG's.

Q. HOW DOES THE AIR EMISSIONS CONTROL EQUIPMENT BEING INSTALLED BY PALMETTO ENERGY COMPARE TO THE EQUIPMENT BEING INSTALLED AT OTHER NEW GENERATING PLANTS IN THE AREA?

A. The emission control equipment and methods of operation that will be utilized by Palmetto Energy at the proposed facility will be consistent with or better than the equipment and methods that are being used by other facilities throughout the country, including several facilities that are presently being planned in South Carolina. The emissions control equipment that will be used at the facility, as well as the inherent design of the plant, will result in one of the lowest emitting power generating facilities in the country.

Q. WHAT IMPACT IS THE PALMETTO ENERGY FACILITY LIKELY TO HAVE ON THE AIR QUALITY IN THE SURROUNDING AREA?

A. The proposed Palmetto Energy Facility is located in an area that is designated by DHEC and EPA as being in attainment of all ambient air quality standards, including ozone. The Palmetto Energy Facility has demonstrated in its Application for a Permit to Construct and Operate Air Emissions Equipment that its predicted impacts on air quality will be insignificant at all locations and for all pollutants. As such, there should not be either a real or perceived threat to any ambient air quality standard, nor should there be any adverse effects on health or welfare as a result of the operation of the Palmetto Energy Facility. As a result of the insignificant nature of the projected impacts, the permitting of this facility will not have any significant or adverse effect

on the ability of others to construct industrial facilities in the region surrounding the Palmetto Energy Facility.

Q. WHAT STEPS HAS PALMETTO ENERGY TAKEN TO ENSURE THAT WATER USE AND WASTEWATER DISCHARGES WILL COMPLY WITH STATE AND FEDERAL REGULATIONS?

A. An integral part of Palmetto Energy Center's proposed facility is a mechanical draft closed-cycle wet cooling system. Cooling water for the plant will be taken from the Catawba River through a new intake structure, which will utilize a submerged wire screen designed to comply with the cooling water intake standards under Section 316(b) of the Clean Water Act. The intake will use passive screen technology to reduce both impingement and entrainment of aquatic species. The proposed intake location is in a deep zone of the river to avoid shallow waters that could be potential habitat for juvenile aquatic species. Prior to use in the cooling system, all incoming river water will be passed through an onsite clarifier and filter to reduce the amount of particulate matter present in the river water. Palmetto Energy Center's National Pollutant Discharge Elimination System (NPDES) permit application provides information on the water in the vicinity of the intake, a description of the selected intake technology, data on the baseline biological condition of the source water, and details on water treatment (i.e., clarification and filtration).. Variables that will determine the amount of water use on a given day include ambient temperature, relative humidity, plant load, and the number of times the cooling water can be recycled before being discharged to the river. Based on the analysis of water samples obtained from the Catawba River and the expected amount of recycling in the cooling

water system, the plant is expected to have a daily average water use requirement of approximately 4.6 million gallons per day (MGD) during normal operation, and up to 9 MGD during conditions when maximum cooling is required and incoming water conditions limit the amount of recycling in the system. Approximately 80 percent of the cooling water will be evaporated to the atmosphere during the cooling process. The remaining 20 percent (1 to 2 MGD) will be returned to the Catawba River. Recycling of the water in the cooling system will result in an increase in the concentration of naturally occurring metals and solids in Palmetto Energy Center's wastewater discharge, This increase will be partially offset by Palmetto Energy's use of clarification and filtration to remove particles from the incoming water prior to use in the cooling system. This increase in concentration will be attributable to solely to the evaporation of water during the cooling process and no additional treatment (other than clarification and filtration of the incoming river water) will be performed before being returned to the Catawba River. A submerged effluent diffuser will be used to rapidly mix the discharge with the receiving stream.

Q. WHAT HAS PALMETTO ENERGY DONE TO PROTECT WETLANDS AND THREATENED & ENDANGERED SPECIES?

A. A comprehensive survey of the proposed Palmetto Energy Facility site has been conducted by CH2M HILL biologists and endangered species specialists and they have determined that there are no wetlands on the 65-acre project site where the plant will be built. There are, however, some small wetland areas that may be traversed by right of ways (ROWs) for water, wastewater, and electric transmission lines (electric transmission line ROW to be provided by Duke Power). If any of these wetland areas

will be impacted as a result of ROW construction, all such activity will be in accordance with the requirements of the US Army Corps of Engineers and SC DHEC. The threatened or endangered species evaluation of the area has indicated that there are no threatened or endangered species within the project boundaries and that construction of the facility is not likely to result in an adverse impact on areas of potential habitat.

Q. WHAT HAS PALMETTO ENERGY DONE TO PROTECT ARCHAEOLOGICAL AND CULTURAL RESOURCES?

A. Palmetto Energy has completed a Phase I Archaeological and Cultural Resources survey of the project site and the proposed ROWs and is currently in the process of completing Phase II investigations of these areas. The purpose of these assessments is to identify those resources that have the potential to be impacted by the development or operation of the proposed facility. Once all resources are identified, appropriate consideration can be given to all identified cultural and archaeological resources so that they can be either avoided or their impact mitigated. Calpine is currently in discussions with representatives of the Catawba Indian Nation and the South Carolina State Historic Preservation Office (SHPO) to identify specific issues and resources of concern.

Q. WHAT HAS PALMETTO ENERGY DONE TO COMPLY WITH REGULATIONS RELATED TO STORMWATER RUNOFF?

A. The Palmetto Energy Center is being designed to control stormwater runoff in accordance with all applicable State, Local, and Federal requirements. Stormwater

permit applications and stormwater pollution prevention plans are currently being prepared for both construction and operation of the facility. These plans demonstrate that the facility is incorporating the appropriate stormwater detention basins and oil/water separators to ensure that contaminated stormwater will not leave the site.

Q. WHAT HAS PALMETTO ENERGY DONE TO REDUCE THE IMPACT ON SOIL AND VEGETATION DURING CONSTRUCTION AND OPERATION OF THE FACILITY?

A. The impact of the Palmetto Energy Facility during the construction phase will be consistent with the impacts of similarly sized projects, and Palmetto Energy will mitigate said impacts to the extent possible using all reasonable means available. This will include the use of stormwater runoff controls and the minimization of fugitive dust during dry conditions. During the construction phase, there will be areas where vegetation and soil will be disturbed, including primary construction zones, material laydown areas, and road access. The remainder of the site will remain in a reasonably natural state. Best management practices will be implemented to control stormwater runoff during construction. During operation, the impacts of the Palmetto Energy Facility are not expected to be significant and, as such, there are not expected to be any measurable impacts on soil or vegetation at any location surrounding the Palmetto Energy Facility. All oil-containing equipment and tanks will have secondary containment and facility personnel will be trained in accordance with the facility's Spill Prevention Plan. It should be noted that, since the facility will utilize only natural gas as its fuel, Palmetto Energy will not store or use a significant amount of oil- or petroleum-based products on the site.

Q. WHAT WILL PALMETTO ENERGY DO TO PROTECT THE AESTHETICS OF THE SURROUNDING AREA?

A. Palmetto Energy will comply with all pertinent Fort Mill and York County buffer and landscape requirements. The Palmetto Energy Facility is being designed to preserve the forested areas along the Catawba River (which borders the site to the south) so as to limit line of site visibility of the river and from locations across the river.

ENVIRONMENTAL PERMITTING

Q. WHAT TYPES OF ENVIRONMENTAL PERMITS ARE NORMALLY REQUIRED FOR FACILITIES OF THIS TYPE?

A. Environmental permits for a generating facility of the type being proposed by Palmetto Energy are normally required for air emissions, water use or withdrawal, wastewater discharges, stormwater runoff, wetlands, and threatened and endangered species, and several minor permits and approvals.

Q. WHAT IS THE STATUS OF PALMETTO ENERGY'S AIR EMISSIONS PERMIT?

A. Palmetto Energy has applied for a Permit to Construct and Operate Air Emissions Equipment. This application was submitted in February of 2002 to DHEC. The application will be undergoing internal agency review and DHEC is expected to issue a final permit by the third quarter of 2002.

Q. IS PALMETTO ENERGY REQUIRED TO OBTAIN WATER SUPPLY PERMITS?

A. Palmetto Energy will obtain authorization for the water intake structure as part of the facility's NPDES permit, which was submitted in February of 2002 to DHEC.. The cooling water intake system that will be used by Palmetto Energy will be considered a cooling water intake structure and will be permitted under 40 CFR 125, Subpart I – Requirements Applicable to Cooling Water Intake Structures for New Facilities under Section 316(b) of the Clean Water Act. Certification that the proposed activities do not violate the State water quality standards will be obtained during the permitting of the water intake through the State's Section 401 Water Quality Certification process.

Q. PLEASE DESCRIBE THE PROCESS UNDERTAKEN TO OBTAIN APPROVAL FOR PALMETTO ENERGY'S WASTEWATER DISCHARGE PLAN.

A. SC DHEC Bureau of Water staff were consulted to discuss the Palmetto Energy Facility's discharge to the Catawba River. The principal wastewater stream will be cooling tower blowdown. Other waste streams may be mixed with this discharge and include demineralization regeneration wastes, steam cycle blowdown, and equipment drains. HRSG discharge (boiler blowdown) will be routed to the cooling tower as a source of make-up water. Process wastewater streams containing oil will be segregated and routed to an on-site oil/water separator. Recycling of the cooling water in the cooling system will result in an increase in the concentration of naturally occurring metals and solids in Palmetto Energy Center's wastewater discharge. This

increase in concentration will be attributable solely to the evaporation of water during the cooling process and no significant additional treatment of either the incoming river water or the cooling water discharge will be required before being returned to the Catawba River. A submerged effluent diffuser will be used to rapidly mix the discharge with the receiving stream. A preliminary engineering report and NPDES permit application have been prepared that includes an anti-degradation assessment, mixing zone evaluation, and cooling water intake structure information. A submerged, single port diffuser design was selected based on the use of EPA's CORMIX model to provide effluent mixing in the river and to facilitate rapid mixing of the discharge in the river. Modeling results show that the temperature difference between the cooling water discharge and the river will be less than 2° F within 15 feet of the diffuser for summer and winter conditions. The CORMIX model also predicts a 20- to 40-fold dilution of concentration for all constituents in the discharge within 100 feet of the diffuser.

Q. PLEASE DESCRIBE THE STATUS OF THE STORMWATER CONSTRUCTION AND OPERATING PERMITS.

A. Prior to the construction of the facility, Palmetto Energy will obtain an NPDES Stormwater Construction Permit. This permit will be obtained at least 1 to 2 months prior to commencement of construction. Prior to operation of the facility, Palmetto Energy will also obtain an NPDES Stormwater Operating Permit. This permit will be obtained at least 1 to 2 months prior to the commencement of "Commercial Operation." Both of these permits will be issued by the DHEC.

Q. WHAT OTHER PERMITS AND APPROVALS MAY BE REQUIRED OF PALMETTO ENERGY?

A. Palmetto Energy may be required to obtain various additional minor permits and/or approvals prior to the construction and/or operation of the plant. Some of these permits and approvals are being deferred until such time as additional design information is available. However, the application for and issuance of these permits or approvals is routine and typical for facilities of the type being proposed by Palmetto Energy. Examples of these minor permits include a Spill Prevention, Control, and Countermeasure (SPCC) Plan (to be prepared prior to operation, approval not required), Title V Operating Permit for air emissions (to be applied for within one year following operation), Emergency Response and Risk Management Plan (to be prepared prior to operation, approval not required), storage tank registration, water and sewer connection approvals, FAA Stack Height Notification, and an erosion and sedimentation control permit. Although not required by any permit or authorization, Palmetto Energy will also obtain clearance letters from the U.S. Fish and Wildlife Service and the South Carolina Heritage Trust regarding Endangered Species on or near the site. A similar clearance letter from the South Carolina Historic Preservation Office regarding the historic structures or artifacts on or near the site will also be obtained.

ENVIRONMENTAL STUDIES

Q. PLEASE DISCUSS THE ENVIRONMENTAL STUDIES THAT WERE CONDUCTED.

A. An integral component of the design and permitting of the Palmetto Energy Facility has been extensive environmental studies and analyses that have focused on evaluating the current environmental condition of the site, and assessing the impact of the facility on the environment during construction and operation. The studies that have been performed are described below.

Q. PLEASE DESCRIBE THE PHASE I ENVIRONMENTAL SITE ASSESSMENT THAT WAS CONDUCTED.

A. Calpine conducted a "Phase I Environmental Site Assessment" of the proposed facility site in June of 2001 to determine if there were any pre-existing environmental conditions that could adversely affect the development of the site for its intended purpose. The results of this assessment indicate that the site itself is free of any known environmental contamination or prior industrial usage that might have otherwise impaired the property.

Q. PLEASE DESCRIBE THE AMBIENT AIR QUALITY IMPACT ANALYSIS THAT WAS PERFORMED.

A. A comprehensive air quality impact analysis was performed to support Palmetto Energy's application for a permit to construct and operate air emissions equipment. This impact analysis was based on the use of DHEC and EPA approved computer models that simulate the dispersion of air pollutants in the atmosphere. The analysis included an assessment of criteria pollutants (*i.e.*, nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, and volatile organic compounds), as well as toxic air pollutants such as ammonia, formaldehyde, and heavy metals. The dispersion

modeling analysis resulted in the conclusion that the emissions from the facility will not cause or contribute to a significant impact on ambient air quality at any location. The analysis also showed that no ambient air quality standard or health-based guideline would be threatened or exceeded as a result of the operation of the Palmetto Energy Facility.

Q. PLEASE DESCRIBE THE WATER USE AND WASTEWATER DISCHARGE STUDY THAT WAS CONDUCTED.

A. Hourly flow records from the Catawba River at Highway 21 (approximately 6,000 feet upstream of the intake site) were reviewed for the period October 1991 through September 2001 to evaluate river flow patterns in the vicinity of the Palmetto Energy site. Palmetto Energy's proposed maximum daily withdrawal rate is less than 0.4 percent of the annual average river flow, and less than 3.5 percent of the FERC mandated minimum flow from Lake Wylie.

A biological baseline study was completed as part of the NPDES permit application to identify aquatic species and life stages in the vicinity of the cooling water intake that may be susceptible to impingement or entrainment in the water intake. The baseline study indicated that there are no known occurrences of protected species of fish or aquatic invertebrates in York County. There have been some observations of some state and federally protected species of mussels in the Catawba River Basin, but none have been observed in the Catawba River between Wylie Dam and Fishing Creek Reservoir. There are other aquatic species of concern in the general area, but none are listed as threatened or endangered. These include a snail (Gravel Elimia) and a fish

(Carolina Darter), but neither have been found in the main channel of the Catawba River and their habitats are not likely to be found in deep pools such as where Palmetto Energy's intake structure will be located. There is also an aquatic plant species of concern (i.e., it is not threatened or endangered), namely the Shoals Spider Lily. However, the lily primarily exists in shallow rocky shoals some 10 miles downstream of the project site. The Shoals Spider Lily does not occur in deep pool habitats.

An anti-degradation assessment that included a discharge alternatives analysis and a demonstration that the discharge will accommodate economic and social development is included in the NPDES permit application for the Palmetto Energy Center. Alternatives reviewed included an NPDES permitted discharge, reuse and recycle, relocation of the proposed discharge location, connection to area wastewater treatment plants, land application, and process design alternatives. A closed-cycle system with a high degree of recycle discharging through an engineered diffuser in the Catawba River was determined to be the most technically and economically viable alternative. The EPA CORMIX model was used to design a submerged discharge diffuser to provide rapid mixing of the discharge in the river. Modeling results show that the temperature difference between the cooling water discharge and the river will be less than 2° F within 15 feet of the diffuser for summer and winter conditions. The CORMIX model also predicts a 20- to 40-fold dilution of concentration for all constituents in the discharge within 100 feet of the diffuser.

Q. PLEASE DESCRIBE PALMETTO ENERGY'S WETLANDS SURVEY.

A. A comprehensive onsite wetlands investigation of the property was conducted by experienced wetlands biologists to determine if there are any wetlands or waters of the Unites States on the project site, or on areas that will be used as ROWs for water, wastewater, or electric transmission lines. The results of this investigation concluded that the main 65-acre plant site had none of the three characteristics of jurisdictional wetlands: hydric soils, positive indicators of wetland hydrology, predominance of hydrophytic vegetation. Therefore, no jurisdictional wetlands are present on the main 65-acre site. Two creeks meeting the definition of "other waters of the United States" were identified on the site. An intermittent stream was identified on the eastern edge of the site that is approximately 10-20 feet in width with water present only within the lowest portions of the drainage. An intermittent stream was observed on the western edge of the site that is approximately 5-10 feet in width, highly incised, with no water present at time of survey.

Some wetlands have been identified on proposed ROWs that will be used for water and wastewater pipelines. The identified wetlands are not extensive and Palmetto Energy will take the necessary steps to avoid or minimize impacts to wetlands. Any wetland impacts associated with the water and wastewater pipeline ROWs will be mitigated in accordance with the requirements of the COE and SC DHEC. The electric transmission line ROWs between the project site and the Duke Power 500 kV transmission lines to the north of the project site will be constructed, owned, and operated by Duke Power. However, wetland surveys conducted on the ROW proposed by Duke Power indicate that only limited wetlands are present and these can

either be avoided or easily mitigated in accordance with COE and DHEC requirements.

Q. PLEASE DESCRIBE THE THREATENED AND ENDANGERED SPECIES SURVEY CONDUCTED ON THE SITE.

A. The threatened and endangered species evaluation of the project site included a literature search and an onsite survey. The literature search included a review of the U.S. Fish and Wildlife Service (USFWS) and the South Carolina Heritage Trust (SCHT) databases for potential and known locations of protected species and their habitats. The USFWS and SCHT databases reported occurrences of some rare, threatened, and endangered (RTE) species in the general vicinity of the project site. An on-site survey of the project site and associated ROWs was conducted in the fall of 2001 and the winter of 2002 by experienced biologists to determine if there was any evidence of these RTE species or their habitat. The results of the onsite survey did not indicate the presence of any protected species within the proposed site boundaries and additional surveys will be conducted during the upcoming growing season. Although potential habitat for some of the identified species could potentially exist within the project boundaries, the onsite survey indicated that the project site is only marginally to poorly suited as habitat for these species. Therefore, it is unlikely that there will be any adverse impacts to any of these species as a result of the development of the Palmetto Energy Center facility. If any rare, threatened, or endangered species are observed to be present on the site, they will either be avoided or their impacts will be mitigated in accordance with the requirements of the COE, USFWS, and SCHT.

Q. PLEASE DESCRIBE THE ARCHAEOLOGICAL AND CULTURAL RESOURCES ASSESSMENT THAT WAS PERFORMED.

A. A Phase I archaeological and cultural resource database survey of the proposed 65-acre Palmetto Energy project site and surrounding area was performed in December of 2001. The background research indicated that there were no previously recorded archaeological sites on the 65-acre project site, although a number of previously recorded sites, including several that are eligible for the National Historic Register, are present within a 1-mile radius of the project site. Some of these sites are associated with former settlements that were occupied or used by Catawba Nation Indians over two centuries ago. Given that the project will require the use of additional land for ROWs for the conveyance of water, wastewater, and electricity to and from the project site, these additional sites are presently being evaluated (including Phase II archaeological testing) to ascertain if they will be impacted. The results of the Phase II archaeological testing has identified one new potential archaeological site on the southern boundary of the 65-acre project site, and confirmed the presence of a former Catawba Nation Indian village in the vicinity of proposed ROW for water and wastewater pipelines. The development of the proposed Palmetto Energy Facility will include appropriate consideration of all identified cultural and archaeological resources so that they can either be avoided or their impact appropriately mitigated. Calpine is currently in discussions with representatives of the Catawba Indian Nation and SC SHPO to identify and confirm the locations of any resources of concern, and to determine any specific issues, concerns, or requirements that those organizations may have with regard to the mitigation of impacts in these areas.

Q. HAS PALMETTO ENERGY CONDUCTED AN ASSESSMENT OF THE IMPACT OF PLANT OPERATION ON REGIONAL VISIBILITY?

A. Palmetto Energy has, in accordance with the requirements set forth by EPA and DHEC, conducted an assessment of the impact on regional visibility, most notably in the Class I areas in North Carolina. The purpose of this assessment was to demonstrate that the operation of the Palmetto Energy Facility would not cause or contribute to the degradation of visibility in these pristine protected areas. The analyses conducted have demonstrated that no such degradation will occur. In the area immediately surrounding the plant, local visibility is not expected to be an issue since the facility will burn only clean natural gas, which will result in a virtually invisible exhaust from the combustion turbines and the auxiliary boiler proposed by Palmetto Energy. The cooling towers that will be used by Palmetto Energy can be expected to generate, during certain times of the year, visible plumes of water vapor. These water vapor plumes are most likely to occur during relatively cold, moist conditions when the condensation of water vapor is most favorable.

ELECTRICAL TRANSMISSION LINES

Q. PLEASE DESCRIBE THE ELECTRICAL INTERCONNECTION BETWEEN THE PALMETTO ENERGY FACILITY AND THE DUKE POWER TRANSMISSION SYSTEM.

A. Duke Power will provide all electrical transmissions lines between Duke's 500 kV transmission lines and a substation that will be located on Palmetto Energy's 65-acre project site. Duke Power will construct, own, and operate the transmission lines and

will be responsible for the acquisition and management of the necessary ROW on which these lines will be built. The lines are expected to traverse Banks Street at the north end of the 65-acre project site, run parallel to the west side of Banks Street up to the 500 kV lines, approximately 4000 ft to the north.

Q. IS THE PROPOSED FACILITY'S PROBABLE IMPACT ON THE ENVIRONMENT JUSTIFIED?

A. Yes. The proposed Palmetto Energy Facility will be constructed using the best available technology to protect the environment, and will provide significant environmental advantages over other generating resource options.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

STATE OF SOUTH CAROLINA
BEFORE THE PUBLIC SERVICE COMMISSION

Docket No. 2001-507-E

In Re: Application of Palmetto Energy Center, LLC for Certificate of Environmental Compatibility and Public Convenience and Necessity to Construct a Major Utility Facility

DIRECT TESTIMONY OF JOHN E. NILAND

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John E. Niland. My business address is Calpine Corporation The Pilot House 2nd Floor, Boston, Massachusetts, 02011.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Calpine Corporation, as a Director of Project Development and I am the Project Manager for Palmetto Energy Center, LLC ("Palmetto Energy").

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I earned a Bachelor of Science in Mechanical Engineering from Northeastern University in 1981. I have over twenty-two years of experience in the power generation industry. I am a licensed Professional Engineer in the states of Rhode Island and Maine. At Calpine, I am Director of Project Development and have responsibility for engineering, permitting and project development activities associated with the sitting, construction and operation of power generation facilities

in the eastern United States. Prior to joining Calpine two and a half years ago, I worked as a project engineer and as manager/director for a large engineering and construction company responsible for the construction of a variety power generation facilities. I also worked in business development and marketing for the power industry.

Q. ON WHOSE BEHALF ARE YOU APPEARING IN THIS PROCEEDING?

A. I am appearing on behalf of Calpine Corporation and Palmetto Energy .

Q. PLEASE DESCRIBE CALPINE'S EXPIERENCE IN SOUTH CAROLINA?

A. Calpine Corporation currently owns two other power facilities in the State of South Carolina, the Broad River Energy Center in Gaffney and the Columbia Energy Center located in Calhoun County, South Carolina. The Broad River facility is a peaking facility with electrical interconnect with Duke Power and its output under contract with Carolina Power and Light Company. Columbia Energy (currently under construction) is a combined cycle plant with cogeneration capabilities that will sell steam to Carolina Eastman at its manufacturing plant in Calhoun County and have the ability to sell electrical power on the wholesale market. Palmetto Energy represents the third power plant proposed to be owned and operated by Calpine Corporation in the State of South Carolina. The combination of these three plants represents a direct investment of over $1.2 billion dollars in South Carolina.

Q. WHAT ARE YOUR RESPONSIBILITIES WITH REGARD TO THE PALMETTO ENERGY PROJECT?

A. As the Director of Project Development, I am responsible for managing all aspects associated with the development of the Palmetto Energy project. My responsibilities include, among others, overall project schedule for permitting, design and construction, plant design and configuration, land acquisition, coordination of all permitting activities, local tax agreements, electrical interconnection, natural gas interconnection and transportation agreements, and project financing.

Q. ARE YOU FAMILIAR WITH THE FACTS AND INFORMATION SET FORTH IN PALMETTO ENERGY CENTER'S APPLICATION?

A. Yes. I was actively involved in the preparation of the Application.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to support Palmetto Energy's Application for a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct and operate a generating plant for the production of electric power and energy in York County, South Carolina and to answer any questions regarding the facility. In my testimony, I will summarize Palmetto Energy 's Application, describe the team of professionals involved in our project and generally describe the design, construction and operation of the PEC generating facility (the "Facility").

Q. WHAT ARE YOUR CONCLUSIONS REGARDING THE PROPOSED PALMETTO ENERGY ?

A. Based upon my review of the Application and the direct testimony of our team of experts, as well as my own knowledge of the project, I have concluded that:

- Calpine and its team of professionals has the capability and expertise to properly design, construct and operate the proposed PEC as a merchant plant in York County, South Carolina;

- Palmetto Energy is a state-of-the-art facility that has been designed to generate electrical energy in a highly efficient manner, while maintaining the reliability and integrity of the regional electrical transmission system and enhancing and serving the interests of system economy and reliability. Combined cycle technology is the most efficient means by which to generate electricity using natural gas. The Facility will employ the Best Available Control Technology (BACT) to reduce its air emission to the lowest feasible levels;

- environmental impacts created by Palmetto Energy (such as water, air quality and natural resources) will be minimal and not adverse and comply with all environmental rules and regulations; environmental impacts were fully evaluated, considering the state of available technology and the nature and economics of various alternatives.

- the PEC site is located in an industrial park for which siting a power plant is a permitted use. The local community has been informed of the plans for the plant and community leaders have openly accepted and support the project;

- there is a need for new combined-cycle merchant facilities to meet anticipated electrical demands in South Carolina and the region, to increase regional

reserve margins, to provide for more power supply diversity, and to create a more vigorous and competitive wholesale market for power and energy ;

- all of the business risk and costs associated with Palmetto Energy will be borne by Calpine's investors, and not by South Carolina or its residents;
- Palmetto Energy will provide significant non-energy-related economic benefits to the State of South Carolina and to York County;
- there will be no negative impacts to South Carolina residents arising from Palmetto Energy 's use of the electric transmission system or natural gas pipeline system;
- the site was carefully selected following consideration of other alternative locations;
- Calpine has received no adverse comments from any governmental agency responsible for environmental protection, land use planning, or other regulation of the proposed site or Palmetto Energy ;
- There is reasonable assurance that Palmetto Energy will conform to all applicable State and local laws and regulations issued thereunder, including any allowable variance provisions; and
- the State of South Carolina and its residents will benefit overall from the existence of Palmetto Energy .

I believe that the construction and operation of Palmetto Energy are in the public interest and is justified by the public convenience and necessity.

Q. WHAT ARE YOUR RECOMMENDATIONS REGARDING THE PROPOSED CALPINE FACILITY?

A. I recommend that the Commission grant Palmetto Energy a Certificate of Environmental Compatibility and Public Convenience and Necessity to construct and operate an electric generating plant in York County, South Carolina.

CALPINE BACKGROUND AND COMMITMENTS

Q. PLEASE DESCRIBE PALMETTO ENERGY CENTER, LLC.

A. Palmetto Energy Center, LLC is a limited liability company organized under the laws of the State of Delaware. Palmetto Energy's principal place of business is in York County, South Carolina. Palmetto Energy is an affiliate of Calpine Corporation.

Q. PLEASE DESCRIBE CALPINE.

A. Calpine Corporation is a publicly traded company that develops, owns and operates wholesale electrical generating facilities in the United States. Based in San Jose, California, Calpine Corporation is an independent power company that is dedicated to providing customers with clean, efficient, natural gas-fired power generation. Calpine has facilities in operation or under construction 27 states in the United States, three provinces in Canada and in the United Kingdom. Calpine also is the world's largest producer of renewable geothermal energy, and it owns and markets 1.3 trillion cubic

feet of proved natural gas reserves in Canada and the United States. The company was founded in 1984 and is publicly traded on the New York Stock Exchange under the symbol CPN.

Q. WHAT IS THE RELATIONSHIP BETWEEN CALPINE AND PALMETTO ENERGY ?

A. Palmetto Energy is a wholly-owned subsidiary of Calpine Corporation.

Q. IS PALMETTO ENERGY CENTER, LLC AUTHORIZED TO TRANSACT BUSINESS IN SOUTH CAROLINA?

A. Yes.

Q. PLEASE GENERALLY DESCRIBE CALPINE'S POWER PLANT DEVELOPMENT ACTIVITIES IN THE UNITED STATES AND IN SOUTH CAROLINA.

A. As a leading national independent power producer, Calpine is committed to developing state of the art gas fired efficient power generating facilities in areas throughout the United States were there is sufficient need for such facilities. Calpine presently has facilities under construction or in operation in all major National Energy Reliability Council (NERC) regions in the United States. As detailed in Mr. Holland's testimony, Calpine has carefully considered the need for power and the substantial benefits to South Carolina (and the region) from the development of the Palmetto Energy Facility. In addition to its proposed Palmetto Energy Facility, Calpine presently operates the Broad River Energy Center, in Cherokee County

which supplies peaking power to CP&L, and is constructing the Columbia Energy Center, in Calhoun County. The Columbia facility will produce steam for use by Carolina Eastman and as well as electrical power for sale in the electrical wholesale power market.

Q. PLEASE DESCRIBE CALPINE'S COMMITMENT TO THE COMMUNITY, ITS EMPLOYEES, SAFETY, AND THE ENVIRONMENT.

A. Calpine is committed to being a good corporate citizen. As I said, Calpine has a significant presence in and commitment to South Carolina. We have a proven track record of working closely with community officials, residents, and environmental agencies to ensure that our facilities fully comply with all environmental requirements and are constructed and operated safely. Since the commencement of this project, Calpine has worked closely with residents, environmental activists, local businesses and elected officials in Fort Mill, South Carolina, and York County to develop the best facility for the area, and to protect the natural resources of the area. This commitment will not end with the commencement of construction or the commercial operation of the Palmetto Energy Facility, but will continue over the many years this facility will be in operation.

Q. CAN CALPINE OFFER REASONABLE ASSURANCES THAT THE FACILITY WILL CONFORM TO ALL APPLICABLE STATE AND LOCAL LAWS AND REGULATIONS, INCLUDING ANY ALLOWABLE VARIANCE PROVISIONS?

A. Yes. As noted above, Calpine is committed to being a good corporate citizen. As Mr. Howroyd's testimony indicates, the Palmetto Energy Facility, as a state-of-the-art gas fired combined cycle facility, is designed to conform to all applicable state and local laws and regulations. Calpine will do what it takes to satisfy all applicable laws and regulations.

Q. PLEASE DESCRIBE CALPINE'S ENVIRONMENTAL GOALS.

A. Calpine is committed to protecting the environment and ensuring that it is a valued and trusted member of the communities in which its facilities are located. This commitment stems from our background as the nation's largest geothermal power producer and our desire to build, own and operate the nation's largest, most advanced fleet of modern clean burning natural gas fired combined cycle power plants in the nation. Calpine utilizes BACT to control plant emissions. We work closely with federal, state and local authorities to ensure that we comply with all applicable environmental statutes, standards and regulations. Ultimately, we recognize that the long-term success of our company and our projects will depend in large part on our ability to protect the environment and be good neighbors. This is evidenced by the fact that one of our projects in California has been endorsed by the local Chapter of the Sierra Club, and the local chapter of the American Lung Association.

THE CALPINE TEAM

Q. PLEASE DESCRIBE THE CALPINE TEAM APPROACH.

A. Calpine has retained a group of highly qualified firms and individual professionals to assist it in designing and developing the Palmetto Energy Facility. These firms and

individuals utilize proven Calpine standard plant designs and specifications to prepare the required initial design documents needed to support our permit applications. This approach insures the final plant design will conform to our permit applications and result in a highly efficient, combined cycle power plant that has the some of the lowest emissions of any power plant in South Carolina. Once we have achieved all of the necessary permits needed for construction of the PEC and obtained the project financing, Calpine will retain the necessary employees, professionals and firms to safely construct and operate the Palmetto Energy Facility.

Q. PLEASE IDENTIFY THE MEMBERS OF CALPINE'S TEAM THAT WILL BE TESTIFYING IN THIS CASE IN SUPPORT OF CALPINE'S APPLICATION.

A. In addition to my testimony, Calpine will present testimony by the following professionals:

- Dr. George C. Howroyd – Dr. Howroyd is a Principal Engineer with CH2M HILL, and will testify as to the potential environmental impacts of Palmetto Energy and the manner in which those impacts are being mitigated;

- Mr. Art Holland – Mr. Holland is an Account Manager with Pace Global Energy Services, and will testify to the need for Palmetto Energy and the impact Palmetto Energy will have on system economy and reliability.

THE PALMETTO ENERGY CENTER FACILITY

Q. PLEASE GENERALLY DESCRIBE THE PROPOSED PALMETTO ENERGY CENTER FACILITY AND ITS LOCATION.

A. The proposed Palmetto Energy is a combined-cycle, natural gas-fired combustion turbine generating plant. The design of the PEC incorporates three General Electric model 7FB natural gas-fired combustion turbine generators. Each turbine will exhaust to a Heat Recovery Steam generator (HRSG) that provides steam to be used in a condensing steam turbine generator (STG). The HRSGs will also include provisions for supplemental firing utilizing natural gas fired duct burners. Natural gas will serve as the sole fuel source for the turbines and duct burners with no backup fuel proposed. Palmetto Energy is to be located on an approximately 86-acre tract of land located in the Bradley Industrial Park in Fort Mill, York County, South Carolina.

Q. PLEASE DESCRIBE THE MAJOR COMPONENTS AND SYSTEMS OF THE PROPOSED PALMETTO ENERGY .

A. Palmetto Energy will be capable of generating approximately 970 MW of electricity using three General Electric Model 7FB combustion turbines. The combustion turbines will be manufactured in General Electric's manufacturing plant in Greenville South Carolina. Each combustion turbine will exhaust to a HRSG that will provide steam to a single STG operating in combined cycle mode. The equipment will be arranged in a "3 x 1" configuration for operational flexibility. The hourly electrical production rate is dependent on operating and ambient conditions such as CTG operating load (percent of maximum load) and ambient temperature.

The HRSG's will also include provisions for supplemental duct firing using natural gas fired duct burners. Supplemental firing of the HRSG's will generate additional steam over that produced by the gas turbine exhaust alone. This additional steam will be used for increased electrical output. In addition, the combustion turbine output will be increased during periods of peak electricity demand through steam injection for power augmented generation (PAG). When operating in PAG mode, steam from the HRSG is injected into the combustion turbine to increase mass flow and accordingly power output.

The Facility will be designed to incorporate the following major components:

- All-weather enclosures that will contain the proposed new combustion turbine generators;
- HRSG structures that will be approximately 80 feet in height and will be equipped with natural gas-fired duct burners;
- Three 160-foot exhaust stacks, one for each combustion turbine generator set, which will exhaust the products of combustion from each CTG /HRSG train;
- Condensing steam turbine generator structure that will house the steam turbine;
- Multi-cell, mechanical draft, wet closed-cycle cooling tower, fitted with drift eliminators to reduce drift to 0.005% of circulating water flow;

- One gas-fired auxiliary boiler rated at 99 mmBtu/hr that will be used to provide steam to the steam turbine during periods of startup (emissions will be routed to a dedicated 100 ft. exhaust stack);

- A single story building to house the Facility control room, administrative offices, laboratory, machine shop, and other miscellaneous service buildings;

- Outdoor electrical switchyard, including station step-up transformers, switches, and power metering equipment;

- Water supply and wastewater service;

- Tanks for raw water and demineralized water storage, etc;

- Paved/gravel/crushed stone roads and parking areas; and

- Diesel-fired emergency generator and diesel fire pump (emergency use only).

Palmetto Energy will be operated as a fully dispatchable generating facility, and can therefore be expected to operate up to a maximum of 24 hours per day, 365 days per year. As fully described in Mr. Howroyd's testimony, the state-of –the-art BACT design will limit nitrogen oxide (NOX) emissions from the proposed CTG/HRSG exhaust to a level of 3.5 parts per million.

The combustion turbine operates by using combustion air that is filtered and compressed in a multiple-stage axial flow compressor. Compressed air and natural gas are mixed and combusted in the turbine combustion chamber. Lean pre-mix dry-lowNOx (DLN) combustors are used to minimize NOx formation during combustion.

Exhaust gas from the combustion chamber is expanded through a multi-stage power turbine that drives both the air compressor and electric power generator prior to being exhausted to the HRSG.

Each GE 7FB combustion turbine generator set will include a compressor section, gas combustion system (utilizing advanced DLN combustors), power turbine, and a 60-hertz (Hz), 18 kilovolt (kV) generator. The GE 7FB combustion turbines are designed to operate in the DLN mode at operating loads from 50 percent up to baseload rating and will be taken out of service for scheduled maintenance, or as dictated by economic or electrical demand conditions.

Exhaust gas exiting the combustion turbine at approximately 1,100°F will be ducted directly to an HRSG where high-pressure steam is produced to generate additional electricity in the STG. One HRSG will be provided for each combustion turbine to recover the waste heat in the exhaust for the purpose of generating steam to drive the STG. Exhaust gas entering the HRSG will be cooled to approximately 170°F to 200°F by the time it leaves the HRSG. Steam production in the HRSGs can also be increased using natural gas fired duct burners located in each HRSG, resulting in additional peak power production. The high-pressure portion of the STG receives high-pressure superheated steam from one or more of the HRSGs, and exhausts to the reheat section of the HRSGs. The steam from the reheat section of the HRSGs is supplied to the intermediate pressure section of the turbine, which expands to the low-pressure section. The low-pressure portion of the STG also receives low-pressure steam from the HRSGs and exhausts to the surface condenser.

An advanced technology Selective Catalytic Reduction (SCR) emission control device will be installed in each HRSG to reduce emissions of NOx from both the combustion turbines and the duct burners. Each HRSG will be exhausted through its own stack.

A multi-cell mechanical draft closed-cycle wet cooling tower will be integral to operation of the Facility. The majority of the cooling water will be used in the surface condenser to absorb the heat rejected from the STG. Water from the cooling tower is commonly referred to as circulating water. The circulating water system will conserve water by increasing the number of times the water can cycle through the cooling tower, thereby reducing the requirements for water make-up. A dedicated set of circulating water pumps will be provided for this service. Circulating water will also be used for direct cooling of plant auxiliaries. The cooling tower itself is a device designed to reject heat from the STG by evaporating clean water. The cooling tower will be fitted with drift eliminators to reduce the amount of drift to 0.005 percent of the circulating water flow rate.

A 99 million British thermal units per hour (MMBtu/hr) natural gas-fired auxiliary steam boiler will be used for heating steam to accommodate plant start-up and to optimize keep-warm conditions. The auxiliary steam boiler will use low-NOx combustors and fire natural gas exclusively. The operation of the auxiliary boiler will be limited to a maximum of 2,500 hours/year.

Natural gas will be delivered to the plant boundary at a pressure sufficient for use in the combustion turbines without additional fuel compression. Once on-site, the

natural gas will first be sent through a knockout drum and filtered for removal of any liquid that may have been carried through the pipeline and delivered to the CTGs, duct burners, auxiliary boilers and space heaters. The natural gas to the CTGs will then be heated using a small natural gas-fired dew point heater during start-up and a performance heater during operation. Due to the critical nature of supplying heated fuel to the CTGs, one dew point heater and one performance heater will be installed in each CTG gas line. After heating, the natural gas will be sent through a filter/separator to remove particulate matter and entrained liquid. Finally, the treated natural gas is delivered to the combustion turbines.

An emergency generator engine (1,200 kW) will be located on-site. The generator will provide power to essential services necessary to protect the equipment during an emergency shutdown resulting from a loss of power. The emergency generator engine will only be used in the event of a disruption of power delivery and during routine readiness testing. A small diesel engine (350 BHP) will be installed to power a fire pump located on-site. The fire pump engine will be operated in the event of a plant fire and during routine readiness testing.

The multi-cell mechanical draft closed-cycle wet cooling tower was selected for use at the PEC as the most effective economic cooling option from a water conservation standpoint. The adjacent Catawba River represents the most practicable supply of raw water. In addition to having adequate water volume to meet project needs, the Catawba River also has sufficient capacity to accept treated process wastewater from PEC.

Discharge of treated cooling water will occur via a new discharge line to the Catawba River, downstream of the water intake structure. The majority of discharged water will be derived from cooling tower blowdown. Other waste streams may be mixed with this discharge and include demineralization regeneration wastes, steam cycle blowdown, and floor and equipment drains.

Palmetto Energy will include all civil works required to support a complete and operable generating facility. These will include, but not be limited to, the following:

- Drainage facilities for controlling and capturing storm water runoff;
- Fencing and security systems for safety protection; and
- Plant roadways and access lighting.

Q. WHAT BUILDINGS WILL BE LOCATED ON THE SITE?

A. There will be several buildings for the Facility. The administrative building will be single story and will house the administration offices, operating personnel offices, control room, locker room, sanitary facilities, maintenance and storage areas, and training areas.

A separate auxiliary building will house the plant water treatment system. A third building will be in the electrical switchyard area and contain electrical protective relays. Each gas turbine and the steam turbine will be housed in a sound-attenuating, all-weather enclosure (which gives the appearance of a building).

Q. HOW WILL THE FACILITY BE CONSTRUCTED?

A. The construction period will last approximately 24 months from "Notice to Proceed" to "Commercial Operation." Initial construction activity will involve the leveling of the site to a grade elevation, followed by the pouring of equipment foundations and the construction of the main building. The major pieces of equipment will be shipped via rail to the closest rail siding (which is within the industrial park) capable of handling the weight of the equipment. Special heavy-haul equipment will be used to convey the equipment from the rail siding to the site. At the site, the equipment will be set on the foundations with heavy lift cranes. As soon as all equipment is set in place, piping and electrical installation will commence. Once erection is complete, comprehensive testing will take place and adjustments will be made before Commercial Operation commences to ensure that the plant is in compliance with the performance and environmental requirements.

Q. WHAT IS THE ESTIMATED COST OF PALMETTO ENERGY ?

A. Palmetto Energy will cost in excess of $400 million.

Q. WHAT SOURCE OF FINANCING DOES CALPINE PLAN TO USE TO CONSTRUCT PALMETTO ENERGY?

A. Calpine currently has two non-recourse credit facilities, Calpine Construction Finance Company and Calpine Construction Finance Company II (CCFC and CCFCII), which provide Calpine with a total borrowing capacity of $3.5 billion. These non-recourse credit facilities are one of the principal vehicles utilized to finance the construction of

Calpine's diversified portfolio of gas-fired power plants. Calpine has not finalized its specific plans for the funding of Palmetto Energy. As construction of the facility nears, Calpine expects that Palmetto Energy would be funded through credit capacity then available under one of the CCFC facilities, most likely CCFCII given its larger size, $2.5 billion, and its longer maturity date. However, Calpine may elect to fund the construction of Palmetto Energy from the proceeds of corporate capital market transactions or from the arranging of a stand-alone project finance transaction. While Calpine currently expects to fund the construction of Palmetto Energy through one of the CCFC facilities, Calpine has demonstrated the ability to raise substantial capital from various sources to fund the construction of its new facilities. Recently completed financing transactions clearly demonstrate that Calpine has competitive and timely access to the capital markets, providing sufficient liquidity to meet current and future capital requirements.

Q. WHEN DOES CALPINE EXPECT PALMETTO ENERGY TO BE IN COMMERCIAL OPERATION?

A. Calpine expects Palmetto Energy to be in commercial operation by the summer of 2005.

Q. WHO BEARS THE RISK IF PALMETTO ENERGY IS NOT SUCCESSFUL?

A. Calpine's equity and debt investors will bear all of the risk of the success of Palmetto Energy , and neither the State of South Carolina nor any of the residents of the State will be responsible for any of the costs of the project.

Q. PLEASE GENERALLY DESCRIBE CALPINE'S PLAN FOR DEVELOPING AND OPERATING THE FACILITY.

A. Construction of Palmetto Energy will commence in the second quarter of 2003 and is expected to last approximately 24 months. Calpine will follow our "Calpine Construct" approach which has been successfully employed on facilities across the country. This approach entails the use of an experienced Calpine project management team who will oversee a qualified Architect/Engineer to prepare design information, following Calpine standard designs and specifications, and an experienced contractor to construct the project. Testing will be performed by a Calpine team experienced in the design and start up requirements of the facility and will commence approximately six months prior to commercial operation. Approximately 27 full-time employees will be hired to operate the facility.

SITE SELECTION

Q. PLEASE DESCRIBE HOW YOU DECIDED TO PLACE A NEW FACILITY IN SOUTH CAROLINA AND HOW CALPINE SELECTED THE SITE FOR PALMETTO ENERGY?

A. As discussed earlier, Calpine operates the Broad River facility and is constructing the Columbia Energy Center. Accordingly, Calpine is very familiar with South Carolina, its growth, associated power needs, electrical infrastructure and natural gas infrastructure. In addition, as set forth in Mr. Holland's testimony, Calpine has evaluated the impact of adding a third plant to the regional market. This evaluation led us to the conclusion that a new plant was economically justified.

Once the decision had been made to develop a new plant, Calpine evaluated list of potential sites using the following criteria: (1) the proximity of adequate electric transmission, (2) the availability of adequate and economic natural gas transportation facilities, (3) the availability of a sufficient water supply and water discharge facilities, (4) the existence of sites located in areas that are zoned in a manner that a power plant would be a permitted use, (5) the absence of significant environmental issues and (6) willingness of the community to support a power generating facility.

Calpine utilized these criteria to select and evaluate specific sites. Calpine first evaluated electric transmission, industrially zoned properties and water availability in the region. In addition, Calpine contacted local economic development officials in the region to assess specific properties We considered all of the factors identified above, and identified a number of suitable sites for a generating facility.

These sites were then visited by a team of Calpine professionals so that a first hand evaluation of their suitability could be performed. This review also included consultation with local officials in order to determine community receptiveness. The Fort Mill site was selected above the other sites under consideration because it was accessible to electric and gas interconnection points, had sufficient water and wastewater facilities, was appropriately zoned with limited potential environmental impacts and it was supported by community officials In addition, Calpine shared the philosophy of the owner of the Bradley Industrial Park (The Springs Company) and recognized the importance of environmental stewardship and community commitment. Calpine had several meetings with the Springs Company and the Close

family members, (owners of the Springs Company) that included two tours of a Calpine facility with similar features to the Palmetto Energy Facility.

ELECTRIC TRANSMISSION ARRANGEMENTS

Q. PLEASE DESCRIBE HOW PALMETTO ENERGY WILL BE INTERCONNECTED WITH THE ELECTRIC TRANSMISSION GRID.

A. Palmetto Energy will be connected to the existing Duke 525 kV Richmond Line (Newport Tie to CP&L's Richmond station). The transmission voltage will be 525 kV, and power will be delivered to the transmission line by looping the transmission line through the plant substation which will be owned and operated by Duke. The switchyard will be designed to ensure adequate transmission capability and protection to ensure no negative impacts on Duke Power's system and its customers.

Q. HAS DUKE POWER CONDUCTED A STUDY OF TRANSMISSION INTERCONNECTION WITH PALMETTO ENERGY ?

A. Yes. Duke Power has performed a thermal impact study of the proposed addition of Palmetto Energy. Duke is also in the process of completing a Facilities Study which identifies all of the upgrades that may be required and their associated costs. Duke's study will also include the stability and short circuit analyses.

Q. WILL THE PALMETTO ENERGY FACILITY NEGATIVELY IMPACT TO THE DUKE POWER TRANSMISSION SYSTEM?

A. No. Duke Power has both the obligation and the capability to evaluate the impacts of Palmetto Energy on its transmission system and protect against any negative impact. Any required upgrades will be paid for by Palmetto Energy and will result in a more robust transmission system. Significantly, as a general proposition, all else being equal, the addition of new generation serves to strengthen the local transmission grid and enhances local reliability.

Q. WHAT IMPROVEMENTS TO DUKE POWER'S SYSTEM WILL BE NECESSARY TO INTERCONNECT WITH THE PALMETTO ENERGY FACILITY?

A. Other improvements on the transmission system notwithstanding, Palmetto Energy will interconnect to the 525 kV transmission line by creating a new loop in the existing line to bring it to through a substation at the Facility. The interconnect, short run (approximately 4000 feet) of double circuit 525 kV transmission lines and the new substation at the plant site will be constructed by Duke and paid for by Calpine. All of the proposed improvements, rights-of-way and new substation are contained within the confines of the Bradley Industrial Park.

Q. WHAT WILL THE IMPROVEMENTS AND ADDITIONAL FACILITIES COST, AND WILL PALMETTO ENERGY BE RESPONSIBLE FOR THOSE COSTS?

A. Calpine will be responsible for all interconnection costs. Duke Power has yet to estimate the electrical interconnection cost. For planning purposes, Calpine has prepared an internal estimate of the interconnection costs, that assumes all potential

upgrades are required to be performed and has set aside sufficient funds to cover these costs.

NATURAL GAS SUPPLY

Q. PLEASE DESCRIBE HOW PALMETTO ENERGY WILL BE SUPPLIED WITH NATURAL GAS.

A. Palmetto Energy will receive its natural gas requirements by means of an interconnection with the Transcontinental Gas Pipeline Company ("Transco") natural gas pipeline through the development and construction of new gas transportation infrastructure to the area surrounding York County, South Carolina. The new infrastructure is expected to consist of a wide-diameter pipeline (in the neighborhood of 24 inches) that will span approximately 37 miles from an interconnection with Transcontinental Pipe Line (Transco) to the Fort Mill area near Rock Hill, South Carolina. The pipeline would be constructed by one of three suppliers competing for the option to build the pipeline lateral required to supply gas to the PEC, Palmetto Energy will continue to pursue these negotiations and work to procure the most economical and reliable gas supply.

Q. HOW WILL PALMETTO ENERGY ACQUIRE SUFFICIENT GAS SUPPLY TO MEET ITS EXPECTED REQUIREMENTS?

A. The new pipeline will accommodate 100% of the gas requirements of the facility from the Transco interconnect. The gas supply will comprised of a Calpine portfolio of gas supply and transportation agreements, including long-term and short term gas

supply contracts. Transportation arrangements will include firm transportation and capacity purchased from secondary markets, including released firm, and interruptible contracts. This structure is intended to provide the flexibility to transport gas from multiple sources including U.S. Gulf Coast, the Appalachian Basin, and gas derived from expanded LNG facilities on the East Coast.

Q. WHAT WILL BE THE EFFECT OF THE INTERCONNECTION OF PALMETTO ENERGY WITH TRANSCO'S SYSTEM?

A. Palmetto's utilization of the Transco system will increase throughput and efficient utilization of the system. We are aware of no negative effects of our interconnection.

Q. WHAT IMPROVEMENTS, IF ANY, TO TRANSCO'S SYSTEM WILL BE NECESSARY TO INTERCONNECT WITH PALMETTO ENERGY ?

A. A tap and metering station will need to be installed on the Transco mainline to provide for delivery of natural gas.

Q. WILL PALMETTO ENERGY BE RESPONSIBLE FOR THE COST OF THOSE IMPROVEMENTS?

A. Yes. Palmetto Energy will be responsible for the costs associated with the interconnection with the Transco pipeline.

Q. WILL THERE BE AN ADEQUATE SUPPLY OF GAS FOR THE FACILITY?

A. Yes. Gas is readily available in the market from numerous suppliers. As stated

above, the contemplated gas infrastructure will have the capability of transporting gas from numerous Gulf Coast and Appalachian gas producing Basins, as well as from the newly expanded LNG facilities at Cove Point MD.

NON-ENERGY-RELATED STATE AND LOCAL BENEFITS

Q. WHAT NON-ENERGY-RELATED ECONOMIC BENEFITS WILL PALMETTO ENERGY CREATE?

A. Palmetto Energy will create substantial non-energy related economic benefits for York County and South Carolina. These benefits include:

Substantial contributions to the tax base while requiring only minimal expenditures on infrastructure by the local government. State tax revenue, in terms of both higher income and sales taxes, is expected to rise due to increased economic activity as a result of the construction and operation of the Facility. This increase in revenue, along with the sales and property taxes directly paid by Calpine, will increase state and county tax revenue during the construction period and during the first twenty years of operation;

Enhanced employment opportunities in the area: highly skilled employees to operate the plant, approximately 400 construction workers during the two-year construction period will result in substantial direct and indirect impacts of Calpine's investment in the facility for the state. ; and

Besides the plant being located in Fort Mill, a major component of the plant, the gas turbines, will be produced in Greenville, South Carolina;

Q. HAS YORK COUNTY INDICATED ITS SUPPORT FOR THE CONSTRUCTION OF PALMETTO ENERGY ?

A. Yes. Local civic and governmental leaders have actively supported the project. Recently, Calpine is aware that business, community and local governmental leaders have offered letters of support for the project to the PSC.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.